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ABSTRACT

A three-faceted investigation was conducted to critically analyze Witkin's conceptualization of cognitive style gleaned from his field dependence/field independence continuum, to identify cognitive style components within the instructional development literature, and to construct a paradigm of the intersections and commonalities between the instructional development and field dependence/field independence literature. Witkin's research is reviewed, as well as the research delineating cognitive style aspects of instructional development. A paradigm linking field dependence/field independence and instructional development was then constructed. Among the results germane to the study were the following: (1) instructional development can optimize concept learning; (2) instructional treatment can be specifically designed to match the cognitive style learning trait of students so as to produce significantly greater concept learning than when such design and matching do not occur; (3) field independent persons were generally found to be superior in learning achievement to field dependent persons; (4) field dependent people are more likely to use external social frames of reference; and (5) the development of cognitive restructuring skills can be fostered by appropriate educational effort. A list of references is attached. (Author/LLS)

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title • FIELD-DEPENDENCE/FIELD-INDEPENDENCE AND
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• Field-Dependence/Field Independence and Instructional Development

In the past quarter of a century, Educational Technology has begun to play a vital role in the learning process not only in education, but in the private sector, government, and industry as well. One particular component within the content area of Educational Technology--instructional development--has become an important aspect of instruction. This component has yearned for a paradigm which could scientifically "match" a learner's cognitive style and the attributes elicited by instructional environments, materials, and media.

Thus, the primary purpose of the investigation was threefold: (a) To critically analyze Witkin's conceptualization of cognitive style gleaned from his field-dependence/field-independence continuum, (b) to identify cognitive style components within the instructional development literature, and (c) to construct a paradigm of the intersection and commonalities between the instructional development and field-dependence/field independence literature.

In order to delineate Witkin's conceptualization of field-dependence/field-independence aspects of cognitive style, the researchers examined three areas: (a) Defining field-dependence/field-independence constructs, (b) enumeration of the characteristics and tests of field-dependent/field-independent subjects, and (c) the implications for educators derived from the research examined.

First of all, it must be noted that Witkin's conceptualization of cognitive style is based upon approximately thirty-five years of research, many times in collaboration with other individuals and researchers in the field; but in the beginning, was one of the first--along with Dr. Joseph Hill--who became famous for cognitive mapping.

Field-dependence, according to Dr. Witkin, "is the tendency to rely on external referents," while "field-independence is the tendency to rely upon internal referents." (Goodenough and Witkin, 1977, p. 2) This then, is a basic definition of the field-dependence/field independence construct.

Turning now to characteristics of field-dependent/field-independent aspects of cognitive style, they are as follows: (a) Process variables; in essence, what is perceived or learned is formulated from either a field-dependent or field-independent perspective, (b) pervasive dimensions of individual functioning, (c) consistent over time as well as across domains, (d) bipolar; while field-dependent subjects tend to stress interpersonal competencies and downplay cognitive restructuring, field-independent subjects tend to place an emphasis upon cognitive restructuring and downplay interpersonal competencies, and (e) value neutral; "it is not inherently better or worse towards one pole of the field-dependence/independence dimension or the other." (Witkin, 1977, pp. 23-29). In summary, according to Witkin, "cognitive styles are concerned with the form rather than the content of cognitive activity,"

and refer to "individual differences as to how we perceive, think, solve problems, learn, and relate to others;" in other words, a lifestyle. (Witkin, Moore, Goodenough, and Cox, 1977, p. 15).

The tests that were developed by Witkin and his associates were perceptual in nature: First, the Body Adjustment Test (BAT), where subjects are seated in a tilted chair in a tilted room and asked to align themselves with the upright, (Witkin, 1959, pp. 51-52); and second, the Rod and Frame Test (RFT), where subjects view a luminous rod centered within a tilted luminous frame and are required to align the rod with the gravitational upright. Those that utilize the external visual field are classified as being field-independent, while those who use the internal referent of their own body are classified as field-dependent. The third test of field-dependence/field-independence derives from perceptual and intellectual activities. It is entitled the Embedded Figures Test (EFT); a test by which subjects are asked to locate and/or break up a complex design in order to locate a hidden figure within the complex figure. (Witkin, Oltman, Roskin, and Karp, 1971, p. 3) Many studies have indicated that field-independence is a cognitive factor, commonly defined by EFT types of tests and which, in literature, has been known as disembedding. (Goodenough and Witkin, p.5)

Other tests have been developed to discriminate between field-dependence and field-independence (e.g. Gardner, Holzman, Klein, Linton, and Spence, 1959). These tests are as follows: (a) Imposition of or-

ganization on an impoverished stimulus array, (b) showing conservation in Piagetian tasks, (c) tests of conservation, and (d) performance on standard paper-and-pencil tests of spatial-visualization. All of these tests have been devised in order to accurately ascertain the preconceived learning style as derived from the field-dependence/field-independence continuum. The next area of research that was undertaken was the implications for education, particularly instructional developers regarding field-dependence/field-independence.

In reference to implications for education in general and instructional development in particular, there are many findings that were noted by Witkin in collaboration with Goodenough, Moore and Cox in Review of Educational Research, Winter, 1977. They are as follows:

1. Field-dependent students are "better at learning materials with social content."
2. There is "no significant difference regarding sheer learning ability or memory."
3. Studies have shown that "field-dependent persons are better at learning social material, when the material is peripheral to the task upon which they are concentrating."
4. "We may expect that field-dependent students would be more likely to require externally defined goals and reinforcements than field-independent students who tend to have self-defined goals and reinforcements." (p. 19)

5. "Field-independent students: learn more using intrinsic motivation conditions than field-dependent students."*
*Caution: "this difference disappears when external rewards for learning are introduced, regardless of whether the rewards are material in nature or in the form of praise." (p.20)
6. "Field-dependence/independence may provide a useful basis for predicting which students are likely to be affected by what kinds of reinforcement."
7. Mediators in learning: (a) In many situations, field-independent people tend to behave as if governed by general principles which they have actively abstracted from their experiences; (b) Field-independent individuals learn when material is instructured and lacks organization; and (c) When material is organized, there are no differences in learning abilities.
8. Programmed instruction: Emmerich "found that field-dependent students profit from a plan while field-independent students profit less from this type of teaching approach."

In concluding this aspect, Witkin states that beyond encouraging teachers to adapt their teaching to students as they find them, we may hope even more that teachers may find ways of helping students diversify their learning strategies."

Charles Eliot's investigation was the only investigation uncovered that made an attempt to link these two aspects and formulate a paradigm.

In his conclusions, he indicated that "learning might be optimized by using the learning characteristic of cognitive style as a basis of instructional design." (1976, p. 4)

Kathryn Martens also delineated several implications derived from research entitled "A Descriptive Study of the Cognitive Style of Field Dependence-Independence in the New Student Population in the Community College." The results of her study "show that the cognitive style of field dependence occurs significantly more frequently in the new student sample than in the traditional or combined student samples." (Martens, 1976, p. 6)

The implications and recommendations for further research are delineated by Martens as follows: (a) "Studies should be designed to determine the effect of various instructional strategies on the academic performance of students with differing cognitive styles;" (b) "Students should be helped to gain insight into their own cognitive style;" and (c) "Community college institutional research staff could establish testing programs for new students."

Witkin's work represents a major research effort involving the description of individual differences. Witkin has tried to organize these differences into a field-dependence, field-independence continuum, and has studied learner styles through perception. The approach has been to correlate various individual personality traits with his three

standardized spatial perception tests for the purpose of better defining individual differences. Witkin's model is deficient in that the continuum does not allow for finite descriptions of individual differences and the tests are too cumbersome to administer to be practical for the classroom teacher.

J.P. Guilford has investigated learner styles through intelligence as contrasted with Witkin's studies of learner styles through perception. Another contrast can be drawn between the statistical treatment of the data afforded by each researcher. While Witkin utilized various correlational techniques, Guilford used factor analysis to generate his morphological model referred to as Structure of Intellect (Guilford, 1967, p. 63). While developing his factorial analysis of intelligence, Guilford saw that "any educational program based on the general objective (no matter how stated) of 'intellectual training,' requires a more competent and precise concept of the nature of intellect, and is what has been lacking" (1958, p. 152).

Guilford addressed his Structure of Intellect model (SOI) to the above need when he stated that:

The new model promises to provide the kind of taxonomy that is needed. Before we can know how to improve intellectual abilities, we must at least know their properties. Such knowledge clarifies some of our tasks in selecting subject matter, in devising methods of instruction, and evaluating effects of learning. (1958, p. 152)

in later work, Guilford was advocating that education should return to an enlightened kind of formal discipline. He said, "When the nature of the generalized intellectual skills is known, we can select the kinds of exercises that should promote their growth" (1960, p. 66)

Although Guilford began his work with human intelligence in terms of verbal and non-verbal abilities, he was really attempting to identify and organize those abilities (factors) which had a significant effect upon student achievement. In a paper presented at the Seventh Annual Western Regional Conference on Testing Problems at the Seventh Annual Western Regional Conference on Testing Problems for the Educational Testing Service in Los Angeles, Guilford stated:

. . . a knowledge of these intellectual factors and their properties should give us better ideas of how to educate for increased intelligence. This is true with regard to curriculum construction and also with regard to teaching procedures. We often set for ourselves the task of teaching students to think. Knowing the kind of thinking operations there are, we can find the subject matter that should involve those operations; and we should know how to induce exercise of them in students. (1959, p. 13)

Guilford made great pragmatic strides in relating intellect, content, and learning modalities along the three major axes of his SOI model. Each of these major axes is subdivided into smaller component parts, producing the potential of 120 separate factors.

Guilford (1967, p. 31) subdivided the dimension of content into four component parts: figural, symbolic, semantic, and behavioral. Support

for the content dimension came from factor analytic studies of tests composed of both numbers and letters. These four factors should be considered when designing content for instructional purposes.

Operation was the second dimension of the model and represented the way in which students learned the content. This dimension consisted of five component parts: cognition, memory, divergent production, convergent production, and evaluation. Cognition was basic to the other four kinds of operations (Guilford, 1967, p. 63). At this point, cognition as defined by Guilford can be equated, with some degree of accuracy, to Murch's (1973, p. 54) discussion of the perceptual process. Potential stimuli that enter the sensory channel (vision, audition, tactition, olfaction, or savory) are transported to the short-term memory. If cognition occurs, then the other components (memory, divergent production, convergent production, and evaluation) may be activated and the information can be processed, resulting in an end product known as "learning."

The product dimension of Guilford's model represented the way or form in which information occurs (1967, p. 63). This dimension has six component parts: units, classes, relations, systems, transformations, and implications. This dimension reflects the organization in which objects are presented to the student, and when tied to the operation dimension, represent the student's perceptual organization of information that is to be learned.

Collectively, this three-dimensional model represented the organization of human intelligence that is complex. Each of the 120 factors

identified by Guilford are not discrete factors. Overlap within, between, and among the factors has been identified by Wiedermann (1973). Also, the complexity of the model is detrimental to practitioner oriented classroom utilization for the purpose of individualizing instruction. The determinants are influencing factors in man's interpretation of symbols and must be assessed when designing a meaningful and productive learning environment (Wasser, 1971, pp. 8-10).

Although historically and empirically the two approaches are different, functional similarities exist in that each is attempting to provide an explanation of how learners interact with the instructional environment. Both researchers have provided organizational "models" which, to some degree, describe learner styles. Each researcher has attempted to provide an explanation of the interaction between the student and the learning environment. Differences among the three models in terms of student "styles" can also be drawn. Witkin worked with perception and its relation to personality; Guilford with the relation and interaction of three components, intellect, content, and learning modalities. Witkin provided for individual differences in the form of a continuum, while Guilford described interrelationships among three components of intellect. Witkin used correlational techniques to perfect his three standardized tests. Guilford used factor analysis to generate his tests for categorizing types of intellectual abilities within his model.

In conclusion, the basic questions that an instructional developer must answer are: (a) Does matching for cognitive style make for better student learning? (b) How does matching or mismatching cognitive style work to produce the effect observed or achieved? (c) What are the roles of situational variables? (d) Does the learning of a particular kind of material favor a particular method, and does it override the effect of teacher/student differences in cognitive style?

The instructional developer's job then seems to be the task of matching learner styles with methodologies, presentation styles, learning environments, and goals and objectives. While this task does not on the surface seem difficult, the underlying assumptions have not been investigated. Thus, more research needs to be completed on the success or failure of these matches.

A word of caution! In a book entitled Accent on Learning, Cross emphasized the danger of matching student and teacher styles. She wrote that, "A consistent match of teaching strategy to student cognitive style may leave the college graduate unprepared to cope with nonpreferred strategies . . . in the real world." (1976, pp. 127-128). Hence, sporadic matching between student and teacher styles may be the more desirable approach.

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